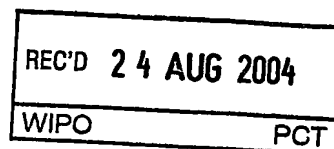




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I, JULIE BILLINGSLEY, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. 2004903775 for a patent by CTECH CLOSURES PTY LTD as filed on 09 July 2004.



WITNESS my hand this
Twelfth day of August 2004

J. Billingsley

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Tamper evident closure with improved tamper evident means and with dispensing means for dispensing the contents of a container in a controlled or limited manner and a re-usable tamper evident cover for the dispensing means.

There is prior art for dispensing closures such as US Patent 5,507,416 and US Patent 4,967,491 and there also exists extensive prior art for tamper evident closures and means of manufacture thereof for example US Patents 8,640,988 and 6,551,093. All of said patents are hereby incorporated in this application.

Prior art dispensing closures such as the conical caps displayed on web site at <http://www.creativepkg.com/twist-top/twist-top.html> -



These prior art closures do not have tamper evident covers and therefore the dispensing orifice at the top of the conical cap is open to airborne or handling or other contaminant vectors such as insects during pre sale shelf life and during period of use. A cellophane type seal could be used but this does not afford protection after initial opening.

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The closures themselves are not tamper evident and the reasons for the absence of tamper evidence includes

Firstly because the moulds to produce these caps are quite complex and the further complication of moulding tamper evidence features on the closure would prove extremely difficult, if not impossible by previously known means.

Secondly because most closures in the market today lose seal before tamper evidence occurs a foil seal is the most positive form of tamper evidence available.

Industry practice with this type of closure has heretofore been that where tamper evidence is required a foil or pressure sensitive coated liner is inserted into the closure and sealed to the container neck opening by means of either pressure exerted by the closure on application to the neck or by an induction heating device. This is an expensive process requiring additional materials and processes

The design of the closure is such that products in containers on which the closure is used are invariably stored with the product at the opposite end to the dispensing orifice thus often requiring an annoying delay for thicker products to flow from the base to the dispensing orifice each time it is used.

The present invention is intended to address the foregoing shortcomings thus being more convenient to use.

We refer to a non-limiting description of the present invention as follows:-

A closure for a container with improved tamper evident means such that the tamper evidence means operates properly and effectively before the seal between closure and container is lost and

a dispensing means portion of the said tamper evident closure to dispense the contents of the container to which the closure is affixed. Said dispensing means being a dispensing cap which has a fully open and fully closed and variable open positions between fully open fully closed. Said dispensing cap also has means for attaching a cover and

a tamper evident cover which protects the dispensing means from accidental or malicious contamination prior to removal of the tamper evident cover by a consumer. The said tamper evident cover is re-usable and easily re-engaged onto the closure or dispensing means in any open or closed position thereby providing continuing convenient protection for the said dispensing means without the need to open and close the dispensing means at each use of the product dispensed or

a tamper evident cover which protects the dispensing means from accidental or malicious contamination prior to removal of the tamper evident cover by a consumer. Said tamper evident cover having frangible bridges connecting the tamper evidence means to the cover body and said frangible bridges being broken and the cover thereby separated from the tamper evidence means by rotating the said cover in the same direction as to open the dispensing cap and the dispensing cap then operating and lifting away from the closed position thereby breaking the frangible bridges. The said tamper evident cover is re-usable and easily re-engaged onto the dispensing cover by way of features such as fins or lugs or projections or recesses on the said cover shaped which are shaped so as to engage with corresponding co-operating projections and or recesses on the dispensing cap so that the said dispensing cap may be manipulated from the closed to the open position and if open manipulated to a closed position by rotating the re-attached cover.

We disclose the following non-limiting examples

Fig. 1 shows a cross sectional view through the centre of a closure body 10 having a top wall annular disc 20 with a depending annular skirt 30 with threads 32 co-operating with container neck threads 68 and having a depending annular tamper evident ring 55

In an alternate version threads 32 and frangible bridges 50 and everything depending therefrom including annular tamper evident ring 55 may be omitted and skirt 30 lengthened to extend past tamper bead 62 on container neck 60 and on inner wall of skirt 30 a retention projection which as the closure is fully applied to the container passes over engagement tamper bead 62 lockingly engaging with engagement surface 61 of said tamper bead 62.

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a dispensing means core 208 manufactured as part of closure body 10 extending above top surface 11 of top wall 20 and having

- one or more dispensing cap lifting ramps 209
- dispensing cap lowering ramps 201
- annular wall 207
- annular retention feature 202
- spigot post 205 having wall 206
- spigot post support 203 . typically there are 3 of these

Fig. 2 shows a cross section through the centre of a closure body 10 with a conical dispensing cap 300 and a tamper evident cover 400.

Said conical dispensing cap 300 having

Sealing feature 301 and

more than one recess 304 to provide a knurled finish to provide gripping means when turning the dispensing cap to close or open position and

sealing feature 302 which is sealingly in contact with annular wall 207 throughout the opening and closing movement of the dispensing cap to provide a seal to prevent leakage of container contents from orifice 204 along wall 207 . Sealing feature 302 is restrained by annular retention feature 202 Fig.2 so that the dispensing cap cannot inadvertently be removed from the closure and

One or more lifting ramp engagement means 310 which engages with the lifting ramp 209 Fig 1. and upon rotation of the dispensing cap in an opening direction lifts the dispensing cap 300 to an open position and

annular closing ramp engagement feature 303 which in co- operation with closing ramp 201 upon closing rotation causes the dispensing cap to be moved in the closing direction 'C' and

annular orifice 305 of diameter 'K' which diameter is smaller than the outside diameter of spigot post 205 such that upon rotation in the direction of closing sealing feature 301 sealingly engages wall 206 thereby providing a positive closure of the container contents from the atmosphere and

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Annular base 306 which may have on its outer wall 307 shaped areas such as serrations or teeth (not shown) which co-operatively engage with corresponding features (not shown) on inner wall 405 of cover 400 such that the rotation of the said cover will cause the said annular base to rotate.

Said tamper evident cover 400 having

Annular top wall 403 and depending therefrom

Annular skirt 404 having

Engagement feature 401 which may be an annular ring or consist of more than 1 individual feature. Said feature or features engage the upper surface of annular base 306 of dispensing cap 300 thereby locating the said cover on said annular base and

Inner wall 405 which may have shaped areas (not shown) which co-operate with corresponding features (not shown) on outer wall 307 of dispensing cap 300 to provide locking engagement of cover 400 with dispensing cap 300. In an alternative arrangement shown in Fig. 4 cover 400 may also be located or in locked engagement with dispensing cap 300 by means of one or more of one or both co-operating projections and co-operating recesses on annular base 306 and lower wall 408. Said projections and recesses being numbered 308 and 309 on annular base 306 and 409 and 410 on lower wall 408 and

More than one frangible bridge 402 which have depending from them an annular or other tamper evidence ring or means (not shown) which engage with corresponding features such as the types shown at 13 and 14 on top wall 20.

As an alternative to shaping inner wall 405 the cover 400 may also be designed to lockingly engage with the dispensing cap 300 after operation of the tamper evidence feature by means of more than one locating engagement fin 407 (dotted line and shaded) depending from annular top wall 403 said locating engagement fins engaging with recesses 304. Said engagement locating fins may be formed on the inner wall of a cylindrical shape 406 (dotted line) depending from said annular top wall 403.

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Fig. 3 shows a plan view of closure body 10 including top wall surface 11 lowering ramp 201 spigot post support 203 orifice 204 spigot post 205 lifting ramp 209

Fig. 4 shows a cross sectional view of cover 400 engagement means 409, 410 engaging with dispensing cap 300 engagement means 308, 309 after tamper evident means (including known means not shown) has been separated from lower extremity of wall 404 for example at frangible bridges 402.

Said engagement or locking engagement means are intended to allow the dispensing cap 300 to be turned from the closed to the open position and open to closed position by gripping and turning the cover and at the first said turning to open to cause by axial movement of the cover 400 whilst tamper evident means is restrained in engagement with projections or recesses such as 13 and 14 (Fig. 2) on the upper wall 11 (in Fig. 1) of and or lifting movement as the dispensing cap engages lifting ramps (209 in Fig. 1) to thereby sever the frangible bridges 402.

Fig. 4 also shows

an additional or alternate means of engagement 412 to engage or locate or lock cover 400 and dispensing cap 300 and

the concept of having the diameter of annular top wall 403 extend beyond depending wall 404 such that the diameter of said annular top wall 403 may be increased to provide a more secure base on which to stand the package when it is desired to orient the package to drain the container contents by gravity towards the dispensing orifice.

Fig. 5 shows a cross section of the mould apparatus used to make dispensing closure body 10. Said mould apparatus having

Annular stripper ring 1C which is affixed to plate 1 and which forms (referring to Fig. 1) the lower surface of wall 30 and depending therefrom frangible bridges 50 and depending therefrom part of tamper band 55 and

Annular outer core 2C which is affixed to plate 2 and which forms (referring to Fig. 1) part of the external wall and the lower surfaces of tamper band 55 and depending therefrom, the outer wall of tamper band engagement means 58 and

Annular threaded core 3 C which is affixed to plate 3 (not shown)

Annular core 4c which is affixed to plate 4 (not shown)

Annular core or stripper sleeve 5C which is affixed to plate 5 (not shown)

Annular core 6C which is affixed to plate 6 (not shown) . Said annular core 6 having within it annular void 8 and hollow tube 7 used to conduct cooling water to the uppermost region of said annular core 6 at least above upper wall 11 of closure body 10. The said portion of annular core 6 above upper wall 11 of closure body 10 forming the inner walls and features including said inner walls being shaped to follow the outer walls and features forming dispensing core means 208 (shown in Fig. 1.) for example the inner wall surface of lifting ramps 209 may be parallel to the upper or outer surface which engages with corresponding lifting ramp engagement means 310 (Fig. 2) formed on the inside of dispensing cap 300 (Fig. 2). and

Said mould apparatus operating as follows

Molten plastic is injected under pressure through orifice 502 which is in fluid communication with void V2. which is formed in the mould closed position as shown by co-operation between mould portions

cavity insert 9C and

Annular cores 1C, 2C, 3C, 4C, 5C and 6C

Said void V2 is thus formed in the desired shape to produce dispensing closure body 10.

After plastic is injected into said void V2 and solidification of the plastic has occurred by heat transfer through

cavity insert 9C to cooling water circulating channel 9W and

through annular core 6C to cooling water circulation channel 8W which may be extended further towards annular retention feature 202 by using a smaller diameter hollow tube 7 and a reduced diameter portion of water circulation channel 8W and

If necessary by adding additional cooling means through annular outer core 2C having one or more cooling water circulation channels (not shown)

Then by relative movement between plate 6 and plates 1,2,3,4,5 and 9 such that plate 6 moves in direction 'C' to withdraw annular core 6 sufficiently to create a void inside dispensing core means 208(Fig. 1) at least adjacent to annular retention feature 202 thereby providing a void into which said annular retention feature 202 can deflect upon opening of the mould.

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The mould then opens at part line 9A as plate 9 is moved in direction 'O'

Plates 1, 3, 5 and 6 then move in unison in direction 'O' and plates 2 and 4 do not move or at least do not move relative to plates 1, 3, 5 and 6 and the relative movement between the annular cores connected to the said plates creates void spaces into which seal 40 and portion of tamper evident ring 55 and tamper evident engagement means 58 can deflect. Said relative movement in direction 'C' of annular core 4C closes void V1 and opens a similar void adjacent to seal 40 and annular outer core 2C moving a similar distance relative to core 1C opens a similar void adjacent to tamper band 55 and tamper band engagement means 58.

Plate 3 then ceases to move and at least plates 1 and 5 continue moving in direction 'O' causing relative movement between said plate 3 and plates 1 and 5 thus causing threaded core 3C to disengage from the closure 10. Said closure 10 is now free of cores 2C, 3C, 4C and 6C and is held by stripper ring 1C and annular core or stripper sleeve 5C remains in contact with the lower surface 21 of top wall circular disc 20.

Plate 1 then ceases to move and plate 5 continues movement in direction 'O' causing core 5 to eject the moulded closure from stripper ring 1C.

Plate 5 then ceases to move and the closure is ejected from the mould.

The mould then closes ready for the next injection cycle.

I refer now to further improvements in mould design

The distance 'I' is the total space available to contain the annular cores 3C, 4C, 5C, 6C. It is highly desirable in large multi cavity moulds operating on fast cycle time to have distance 'I' as large as possible at least for the following reasons

It is desirable to have core 6C as large as possible in diameter so that hollow tube 7 and water channel void 8W can be of sufficient diameter to accommodate the flow of a large volume of cooling water thus enabling the moulded part to solidify and be ejected earlier thus enabling the mould to produce more parts in a given time

It is also desirable to have the wall thickness of annular cores 3C, 4C and 5C and distance 'H' and any interspacing bushes (not shown) of dimension as large as can be accommodated to ensure that the construction of the mould is robust and can last for many millions of cycles.

In pursuit of the aforementioned desirable characteristics I make the following observations

Distance 'F' (the length of tamper band engagement means 58) and Distance 'G' the distance from the end of tamper band engagement means 58 to the point at which the outer wall of annular core 3C becomes parallel to the axis of annular cores and

By reducing distances 'F' and 'G' the point at which the outer wall of annular core 3C becomes parallel to the axis of annular cores occurs such that distance 'I' is thereby increased.

Angle 'E' is also fundamental in determining distance 'I' . By restricting angle 'E' to less than 50 degrees and preferably 45 degrees or less then the point at which the outer wall of annular core 3C becomes parallel to the axis of annular cores is further from the said axis thereby increasing the distance 'I'.

Fig. 6. shows a partial cross section of an alternative dispensing closure which is simplified in that it has less parts than earlier examples in this application and is thereby less costly to manufacture.

Closure 10 incorporates the dispensing means 20 having annular dispensing orifice 22 . Said annular dispensing orifice 22 is sealed by co-operation with annular sealing device 42 on tamper evident sealing cover 40.

The tamper evident sealing cover 40 may be in any shape such as a shape closely following the shape of dispensing portion 20 and or may attach to the closure at points other than that shown by the location of the tamper ring 43. For example the tamper ring 43 may be located on the dispensing portion 20 .

It is desirable to be able to have annular dispensing orifice 22 of smaller or larger diameter according to the viscosity and contained particle size of the contents to be dispensed.

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Frangible bridges 45 which attach the tamper ring 43 to the wall of the said tamper evident sealing cover are severed upon removal rotation of the said tamper evident sealing cover. Said tamper ring has engagement means to restrict removal rotation and promote fracture of said frangible bridges.

Tamper evident sealing cover 40 may be re-attached to the closure body after initial opening by means of annular projection 47 which in co-operation with annular engagement ridge 123 locates and holds said tamper evident sealing cover 40.

Closure 10 may be produced by mould assembly disclosed in Fig.5 by modifying the shape of that portion of the closure above top wall annular disc 20 (fig. 5) to shape the hollow dispensing portion 120 (fig. 6)

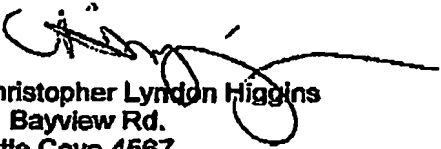
Shown in Fig. 7. is orifice device 30 which lockingly engages by known means with dispensing portion 120. Said orifice variation device may have annular orifice of any desired diameter refer examples 31, 32 and 33. Said orifice device co-operates with annular sealing device 42 to seal the container. Use of said orifice device allows production of only one size closure to satisfy various requirements. Thereby conferring benefits such enabling making one larger cavitation closure mould to accommodate all orifice sizes with corresponding cost efficiencies

If orifice control device is attached after filling then stock holding of closures for customers requiring dispensing closures with various size dispensing orifices is thereby reduced because the customer holds only one closure size but various sizes of the much smaller orifice variation devices.

Explanation of the improved tamper evident means may be found in earlier provisional applications by the undersigned which are hereby incorporated in this application.

The tamper evident sealing cover 40 may be in any shape such as a shape closely following the shape of dispensing portion 20 and or may attach to the closure at points other than that shown by the location of the tamper ring 43.

Those skilled in the art may discover other examples of the foregoing inventions without departing from the present invention.



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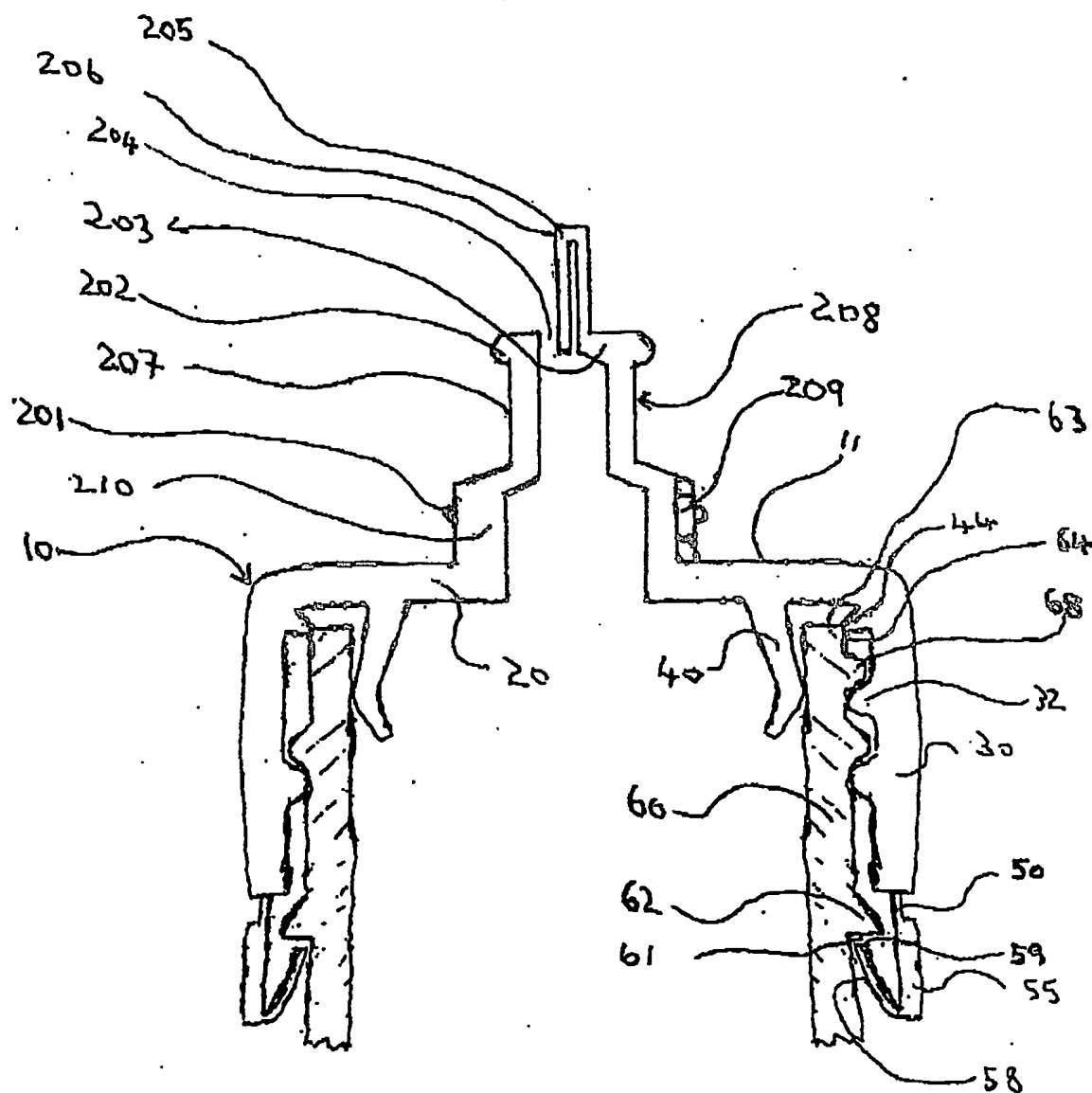


FIG 1.

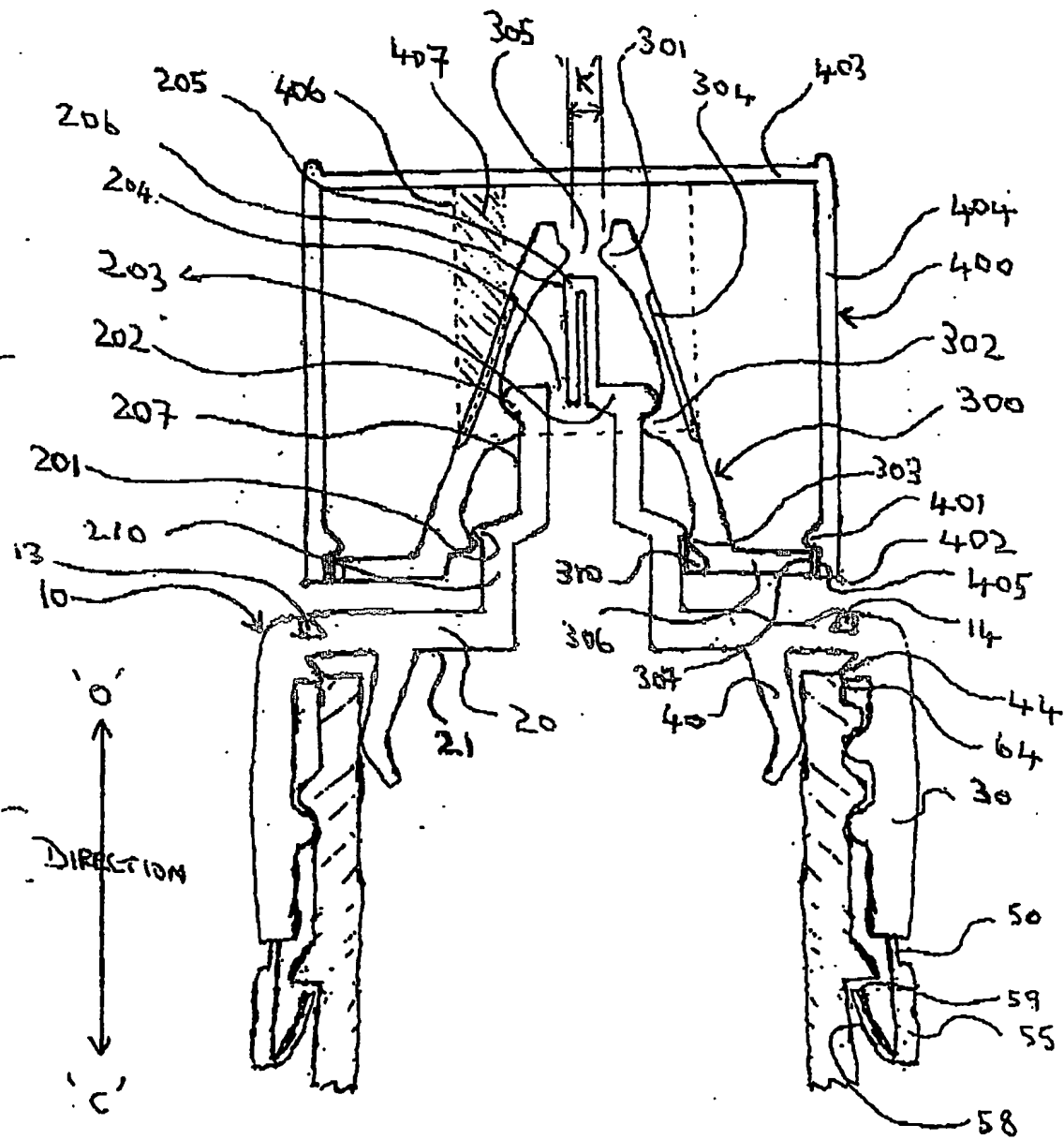


FIG. 2.

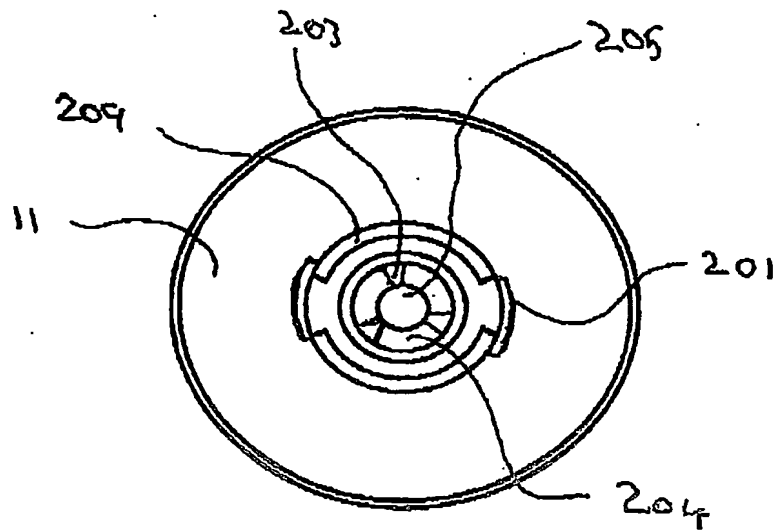


FIG 3.

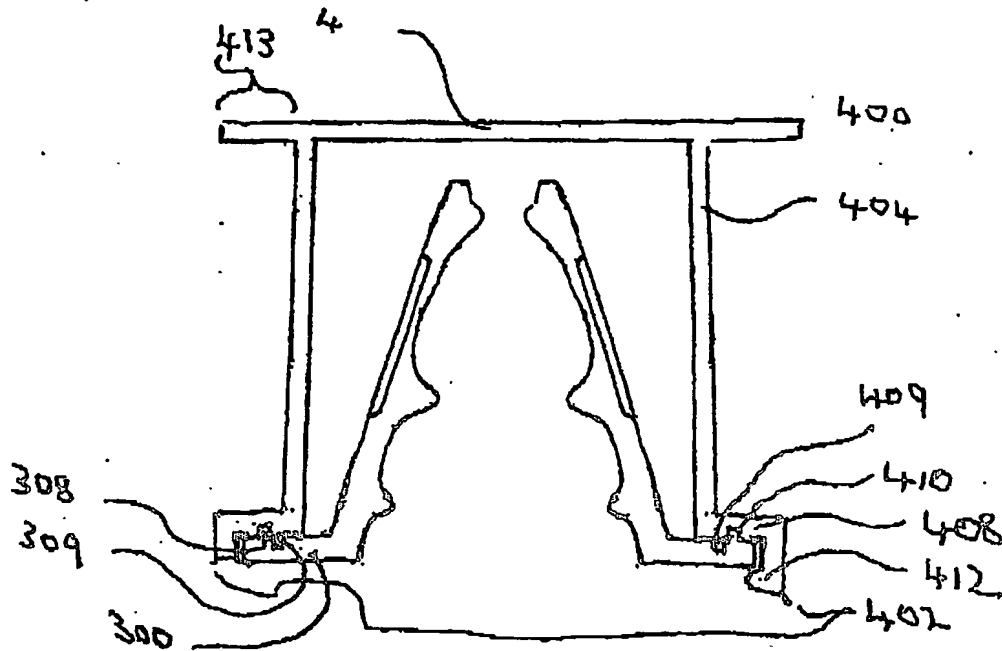
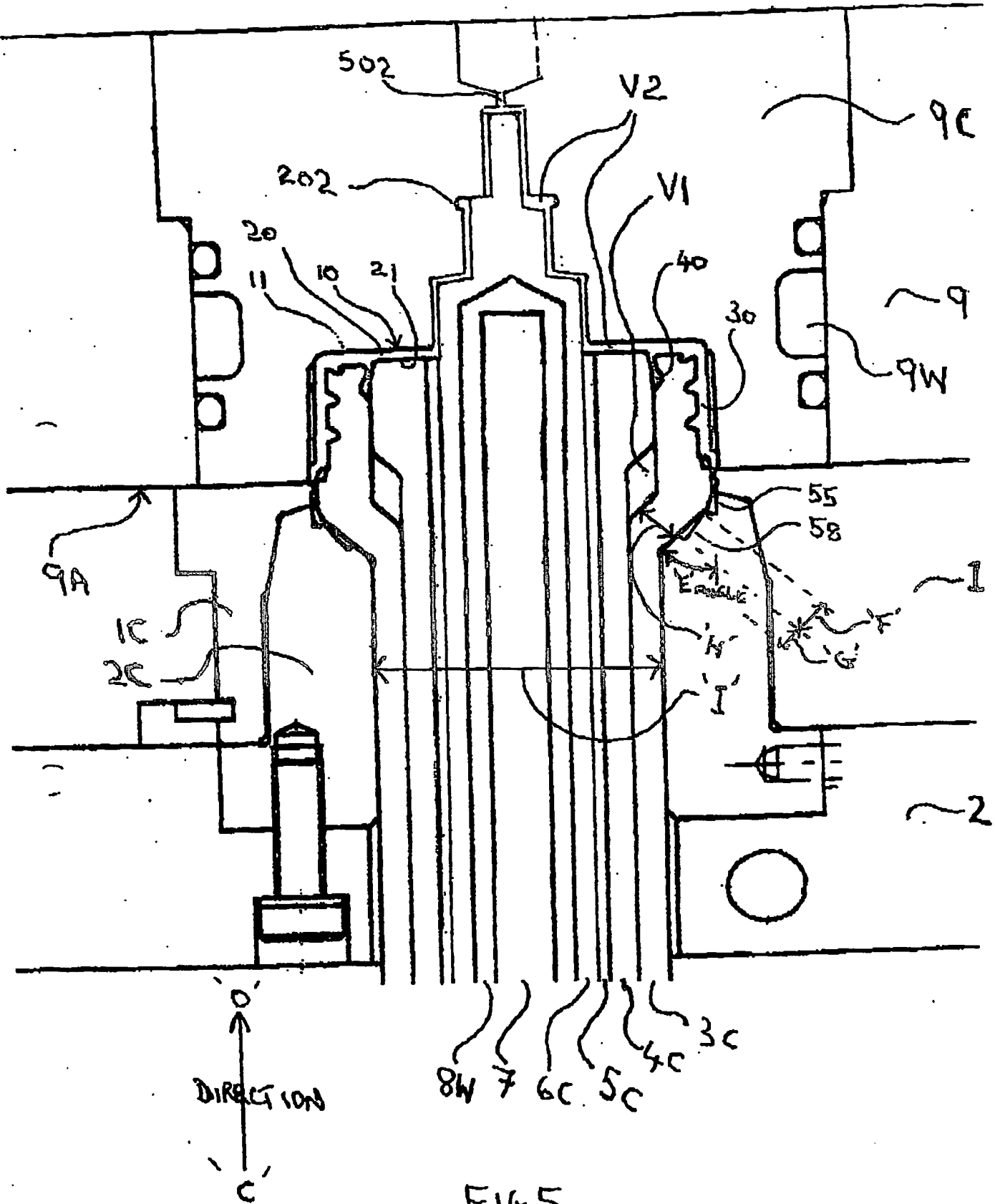


FIG. 4.



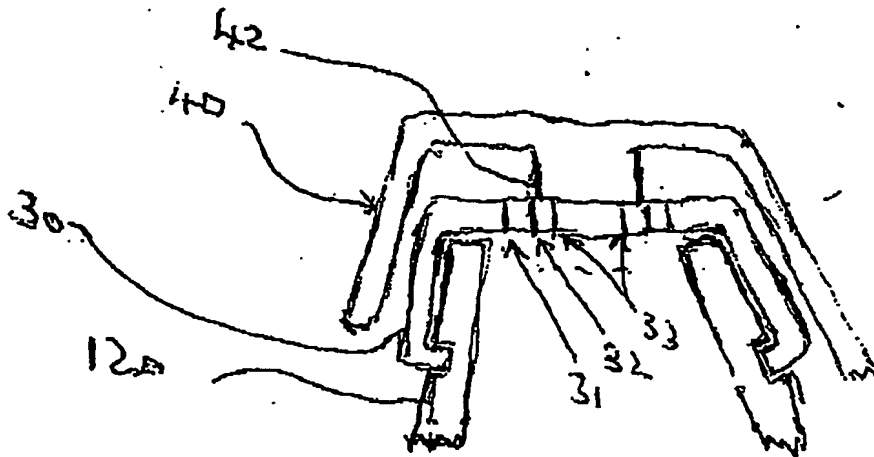


FIG. 7.

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